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# मानक

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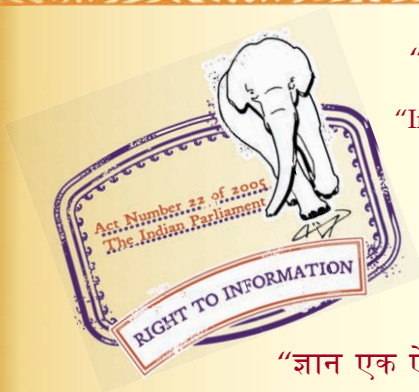
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IS 4804-3 (1969): Resistance welding equipment, Part 3:  
Single phase spot and projection welding machines [ETD 21:  
Electric Welding Equipment]



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“Knowledge is such a treasure which cannot be stolen”



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IS : 4804 ( Part III ) - 1969

*Indian Standard*

SPECIFICATION FOR  
RESISTANCE WELDING EQUIPMENT

PART III SINGLE-PHASE SPOT AND PROJECTION  
WELDING MACHINES

Second Reprint DECEMBER 1982  
( Incorporating Amendment No. 1 )

UDC 621.791.763.1/.2.03



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INDIAN STANDARDS INSTITUTION  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# *Indian Standard*

## SPECIFICATION FOR RESISTANCE WELDING EQUIPMENT

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**MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG**  
**NEW DELHI 110002**

# Indian Standard

## SPECIFICATION FOR RESISTANCE WELDING EQUIPMENT

### PART III SINGLE-PHASE SPOT AND PROJECTION WELDING MACHINES

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*Indian Standard*  
**SPECIFICATION FOR  
RESISTANCE WELDING EQUIPMENT  
PART III SINGLE-PHASE SPOT AND PROJECTION  
WELDING MACHINES**

**0. FOREWORD**

**0.1** This Indian Standard ( Part III ) was adopted by the Indian Standards Institution on 24 August 1969, after the draft finalized by the Electric Welding Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

**0.2** This part covers ac single-phase press type spot and projection welding machines, manually, pneumatically, motor and hydraulically, operated; and designates the electrical ratings together with the mechanical requirements, such as nominal electrode forces, throat depths and clearance, dimensions of platens, electrodes, etc. Requirements for methods of actuation, operating speeds, cooling and mechanical and electrical features are also specified.

**0.3** This standard is not complete by itself and shall be read in conjunction with IS : 4804 ( Part I )-1968\*.

**0.4** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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**1. SCOPE**

**1.1** This standard covers the essential electrical and mechanical features pertaining to standard sizes of stationary single-phase ac transformer, press type spot and projection welding machines. It does not include electrical and electronic control equipment.

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\*Specification for resistance welding equipment: Part I Single-phase transformers.

†Rules for rounding off numerical values ( revised ).

**1.2** This standard does not cover portable, fixture type or gun type resistance spot and projection welding machines, nor does it cover special multi-spot projection welders of frequency conversion types.

## **2. TERMINOLOGY**

**2.0** For the purpose of this standard, the following definitions shall apply.

**2.1 Spot Welding** — Resistance welding in which the welding current is passed through the components of the workpiece in an area confined by electrodes contacting and applying pressure to produce a weld.

**2.2 Projection Welding** — A resistance welding process wherein coalescence is produced by the heat obtained from resistance to the flow of electric current through the work parts held together under pressure by electrodes. The resulting welds are localized at predetermined points by the design of the parts to be welded. The localization is usually accomplished by projections, embossments or intersections.

**2.3 Press Type Spot Welding Machine** — A stationary spot welding machine with a top arm fixed to the frame and containing a ram which carries a platten and is directly operated vertically by manual, motor, air or hydraulic means. To the platten is fixed the horn carrying the electrode holder and electrode.

**2.4 Press Type Projection Welding Machine** — A stationary resistance welding machine with a top arm fixed to the frame and containing a ram which carries the platten and is directly operated vertically by manual, motor, pneumatic or hydraulic means. It is also provided with a lower arm containing another platten. To these plattens are attached the projection welding dies.

**2.5 Throat Depth** — The unobstructed work clearance in a welding machine from the centreline of the electrodes or plattens to the nearest point of obstruction of flat work or sheets.

**2.6 Throat Clearance** — The unobstructed work clearance in a welding machine between arms throughout the throat depth.

**2.7 Arm** — A projecting beam of a resistance welding machine which transmits the electrode force and may conduct the welding current.

**2.8 Platen** — In a resistance welding machine, a member with a substantially flat surface to which dies, fixtures backups or horn carrying electrode holders, are attached, and which transmits the electrode force or upsetting force.

**2.9 Platen Spacing** — In a resistance welding machine, the distance between adjacent surfaces of the plattens.

**2.10 Ram** — The assembly on press type welding machine through which motion and forces of the operating means are transmitted to the electrode.

**2.11 Air Cushion** — A pneumatic pressure device incorporated in the air operating mechanism of the resistance welder to provide a deceleration of a mechanical motion which may or may not be adjustable.

**2.12 Die** — A member, usually shaped to the work contour, used primarily to clamp the work and may or may not carry the weld current.

**2.13 Horn** — In a resistance welding machine, an essentially cylindrical arm or extension thereof which transmits the electrode force and usually conducts the welding current.

**2.14 Horn Spacing** — In a resistance welding machine, the distance between adjacent surfaces of the horns.

**2.15 Knee** — In a resistance welding machine, the lower arm structure.

**2.16 Moveable Platen** — The platen which is moved relative to the main body of the machine by the operating mechanism.

**2.17 Electrode** — A replaceable portion of a resistance welding machine which transmits current, and usually applies pressure directly on the workpiece.

**2.18 Nominal Electrode Force** — The theoretical force ( neglecting friction, inertia, etc ) transmitted by the electrodes to the components of the workpiece.

**2.19 Electrode Holder** — A device used for mechanically holding the electrode and conducting current to it.

**2.20 Welding Current** — The current passing through the parts to be welded at the fused area.

### 3. DESIGN AND PERFORMANCE

**3.1 Methods of Actuation** — For all machine sizes the methods of actuation shall be manual, pneumatic, hydraulic or motor operated ( see Table 1 ), as follows:

- a) *Manual Actuation* — Manual actuation shall be by means of a foot-operated pedal acting through a connecting rod and adjustable spring.
- b) 1) *Pneumatic Actuation* — Pneumatic actuation shall be by means of directly connected double acting cylinder mounted above the ram, having a connecting piston rod with or without adjustment and arranged to apply pressure through a single pressure control.

- 2) Pneumatically operated machines shall be provided with a solenoid valve actuated by either a hand or foot switch.
- c) *Motor Actuation* — Motor actuation shall be by means of a motor operating through a variable speed device or gear box or both, cam and adjustable spring. The arrangement of the means of actuation shall be such as to provide a variable speed ratio of approximately 3 to 1 and permit control by a foot-operated clutch.
- d) *Hydraulic Actuation and Control*
  - 1) *Hydraulic Operation* — Operation shall be obtained by means of a directly connected double acting hydraulic cylinder mounted above the ram, having a connecting piston rod with or without adjustments and arranged to apply pressure through a single pressure control and will include self-contained motor driven pump and hydraulic system.
  - 2) *Operating Control* — Hydraulically operated machines shall be provided with a solenoid operated valve actuated by either a hand or foot switch.

**3.2 Maximum Operating Speeds** — Pneumatic and motor operated welding machines, measured at 13 mm electrode stroke, shall be capable of operation at:

- a) 80 strokes per minute for machines upto 50 kVA,
- b) 50 strokes per minute for machines from above 50 kVA upto and including 100 kVA, and
- c) 30 strokes per minute for machines above 100 kVA.

Hydraulically operated welding machines measured at 13 mm electrode stroke shall be capable of operation at 30 strokes per minute.

### 3.3 Electrical Rating

**3.3.1** The preferred ratings in kVA for projection welders shall be the following:

5, 20, 30, 50, 75, 100, 150, 250, 300, 400, 500

**3.3.2** The preferred ratings in kVA for spot welders shall be the following:

5, 20, 30, 50, 75, 100, 150, 250

**3.4 Nominal Electrode Force** — The nominal electrode force shall be in accordance with the relevant value given in Table 1.

### 3.5 Mechanical Features

**3.5.1 Nominal Throat Depth and Clearance** — The nominal throat depth and clearance shall be in accordance with the relevant value given in Table 1.

**NOTE** — Although a range of dimensions is shown in Table 1, this does not necessarily mean that the throat depths and clearances are infinitely variable within that range.

**3.5.2 Platens, Horns, Electrode Holders and Electrodes** — The dimensions of horns and the size and taper of electrode holders shall be as given in Table 1. The dimensions of platens shall be as given in either Table 2 or Table 3.

### 3.6 Accessories

**3.6.1 Accessories for Pneumatic Actuation** — Air line accessories shall include the following:

- a) Air line filter,
- b) Air line lubricator,
- c) Air pressure regulating valve,
- d) Air ( welding ) pressure gauge, and
- e) Air speed control valves or air cylinder cushions.

#### 3.6.2 Motor Operation

a) **Welding Force Adjustment** — Motor operated welders having an air type welding force adjustment shall be supplied with the following accessories:

- 1) Air pressure regulating valve, and
- 2) Air ( weld ) pressure gauge.

b) **Motors and Motor Starters** — These shall comply with IS : 325-1961\* and IS : 1822-1967† respectively.

c) **Limit Switch** — Motor operated welders shall be provided with a limit switch to control a contactor in the line either directly or through a timer.

d) **Weld Power On-off Switch** — All motor operated welders shall be provided with a weld power on-off switch.

**3.6.3 Hydraulic Operation** — Hydraulically operated welders shall be provided with the following accessories:

- a) Pressure regulating valve, and
- b) Weld pressure gauge.

\*Specification for three-phase induction motors ( *second revision* ). ( Since revised ).

†Specification for ac motor starters of voltage not exceeding 1 000 volts ( *revised* ).

TABLE 1 MECHANICAL STANDARDS FOR SINGLE-PHASE SPOT AND PROJECTION WELDING MACHINES

( Clauses 3.1, 3.4 and 3.5.1 )

TYPE  (1)	RATED kVA AT 50 PERCENT DUTY CYCLE  (2)	NOMINAL THROAT DEPTH  (3) mm	NOMINAL ELECTRODE FORCE*  (4) kgf	PLATEN SPACING†  (5) mm	PLATEN Dim  (6) mm	HORN Dia  (7) mm	ELECTRODE HOLDERS						STANDARD RAM STROKE‡  (14)
							ISO  (8) mm	Dia Morse  (9) mm	ISO Taper  (10) mm	Morse Taper No. (11)	Length		
											Upper (12) mm	Lower (13) mm	
Proj	5	150	110	20 to 95	50 × 50	SPECIAL							25
Spot		200											
Proj	20	150	250	25 to 100	75 × 75	38	20	19	13	1	200	200	50
Spot		200											
Proj	30, 50	150	450	50 to 125	100 × 100	51	25	25.4	16	2	200	200	50
Spot		200											
Proj	30, 50, 75	300 450 750	1 000 750 450	150 to 300	150 × 150	—	—	—	—	—	—	—	75
Spot	30, 50, 75	450 600 900	1 000 750 450			57 to 70	31.5	31.5	20	2	200	300	
Proj	100, 150	300 450 750	1 800 1 350 1 000	150 to 300	200 × 200	—	—	—	—	—	—	—	75
Spot	100, 150	450 600 900	1 800 1 350 1 000			70 to 76	50 or 40	38	31.5 or 25	3	200	300	
Proj	150, 250	300 450 750	4 100 2 850 2 300	150 to 300	230 × 230	—	—	—	—	—	—	—	100
Spot	150, 250	450 600 900	2 300 2 300 2 300			76 to 89	63 or 50	38	49 or 31.5	3	200	300	
Proj	300, 400, 500	300 450 750	6 000 6 000 4 150	200 to 355	300 × 300	SPECIAL							100

\*Nominal electrode force values are based on air line supply pressure of 5.62 kg/cm<sup>2</sup> for pneumatically operated machines, and operator's force on the foot pedal of 30 kgf in the case of manually operated machines.

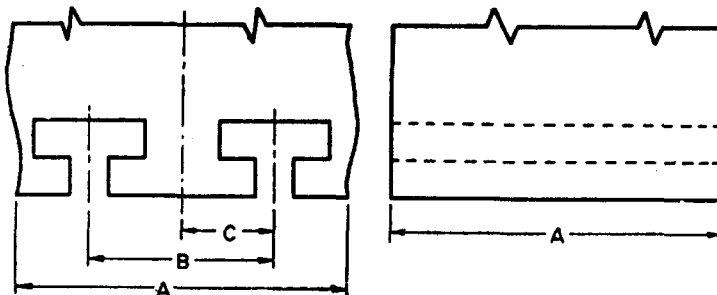
†Platen spacing of projection welders shall be measured with upper platen in down position and the range of platen spacing is that obtained by vertical adjustment of lower platen.

‡Standard ram strokes shown include adjustments.

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TABLE 2 DIMENSIONS FOR PLATEN WITH 'T' SLOT FOR PRESS WELDERS

( Clause 3.5.2 )



A	B	C	BOLT SIZE
75 × 75	38	19	M8
100 × 100	60	30	M8
150 × 150	88	44	M12
200 × 200	128	64	M16
230 × 230	150	75	M20
300 × 300	200	100	M20

NOTE 1 — The upper and lower 'T' slots shall be 90° to each other.

NOTE 2 — 'T' slot dimensions shall comply with IS : 2013-1962 'Dimensions for T-slots'. ( Since revised ).

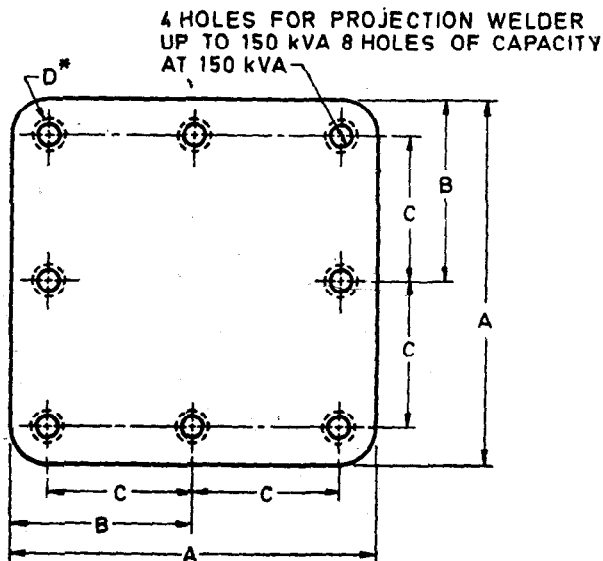
NOTE 3 — 'T' bolts dimensions shall comply with IS : 2014-1962 'Specification for T-bolts'.

**3.7 Water Cooling** — When machines are provided with water cooling, they shall comply with the following requirements:

- A minimum of one circuit shall be provided for machines rated up to 50 kVA;
- A minimum of two circuits shall be provided for machines rated up to 50 kVA if the transformer is of the water-cooled type;
- Machines above 50 kVA rating water cooling shall be supplied to the following parts:
  - One circuit each for the welding transformer, upper electrode holder, and lower electrode holder; and
  - Secondary conductors may also be cooled by any of the above circuits.
- A suitable visual drain manifold shall be provided with all machines;
- A suitable inlet shall be provided; and
- Where a machine has more than one cooling circuit it shall have flow adjusting valves for each cooling circuit.

**TABLE 3 DIMENSIONS FOR PLATEN WITHOUT 'T' SLOT FOR PRESS WELDERS**

( Clause 3.5.2 )



A	B	C	D*
75 × 75	37.5	30	M6 × 1.0
100 × 100	50	35	M8 × 1.25
150 × 150	75	60	M8 × 1.25
200 × 200	100	80	M12 × 1.75
230 × 230	115	95	M12 × 1.75
300 × 300	150	130	M12 × 1.75

\*Screw Thread shall comply with IS : 4218-1967 'ISO metric screw threads'.

### 3.8 Electrical Features

**3.8.1** Voltage adjustment shall be obtained through a plug or link arrangement or tap change switch of not less than 8 steps, providing a minimum open-circuit secondary voltage which shall be 55 to 65 percent of the maximum open-circuit voltage.

A series/parallel connection arrangement may be provided as alternate equipment from which a minimum secondary open-circuit voltage of 50 percent of the maximum shall be obtainable.

Standard input voltage shall be 415 volts 50 Hz.

**3.8.2 Initiating Control** — The nominal voltage on any initiating switch shall not exceed 110 volts.

**NOTE** — This stipulation is not applicable to small machines below 25 kVA rating.

**3.8.3 Test for Rating ( Maximum Conventional Power at 50 Percent Duty Cycle )** — The secondary circuit of the transformer shall be short-circuited in the manner described in 3.8.4. The temperature-rise test shall then be carried out in accordance with the method described in 7.6 of IS : 4804 ( Part I )-1968\*.

### 3.8.4 Short-Circuit Conditions

**3.8.4.1 Projection welders** — The short-circuit shall consist of placing a copper bar machined flat on each end, and under full pressure, between the welder platens and at the centre of the platens.

#### Welder Size

#### Bar Size

Up to and including 50 kVA  
Above 50 kVA

38 mm diameter × 76 mm length.  
76 mm diameter × 200 mm length.

**3.8.4.2 Spot welders** — The short-circuit shall consist of substituting a copper rod of the same diameter as the electrode holders in place of the holders and to adjust the vertical clearance between the inner surfaces of the horns to 200 mm for sizes above 50 kVA and to 75 mm for sizes upto and including 50 kVA.

### 3.8.5 Short-Circuit Secondary Current

**3.8.5.1** The short-circuit secondary current when determined in the relevant manner described in IS : 4804 ( Part I )-1968\* with the throat clearance and the throat depth as specified in Table 4, shall comply with the minimum values given therein.

**3.8.5.2** Transformers of press type projection welders shall be capable of operating at not less than 5 percent duty cycle at the indicated short-circuit current without exceeding the temperature-rise specified in IS : 4804 ( Part I )-1968\*.

**3.8.5.3** Transformers of press type spot welders shall be capable of operating at not less than 4 percent duty cycle at the indicated short-circuit current without exceeding the temperature-rise specified in IS : 4804 ( Part I )-1968\*.

**NOTE** — For the purpose of compliance with 3.8.5.2 and 3.8.5.3, it shall suffice to compute the duty cycle in accordance with the formula given in 4.3.1 in IS : 4804 ( Part I )-1968\*,  $P_x$  being taken as the product of the minimum short-circuit current in kA and the maximum open-circuit secondary voltage.

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\*Specification for resistance welding equipment: Part I Single-phase transformers.

**TABLE 4 THROAT DEPTH AND SHORT-CIRCUIT SECONDARY CURRENT**

( Clause 3.8.5.1 )

PRESS TYPE PROJECTION WELDERS		TRANSFORMER RATING AT 50 PERCENT DUTY CYCLE	PRESS TYPE SPOT WELDERS	
Throat Depth	Short-Circuit Secondary Current		Throat Depth	Short-Circuit Secondary Current
(1)	(2)	(3)	(4)	(5)
cm	Kiloamperes	kVA	cm	Kiloamperes
15	7	5	20	6.5
15	15	20	20	14
15	22	30	20	21
30	22		45	17
45	20		60	15
75	18		90	15
15	29	50	20	28
30	28		45	22
45	24		60	19
75	23		90	19
30	37	75	45	27
45	30		60	23
75	29		90	23
30	46	100	45	31
45	37		60	27
75	37		90	27
30	60	150	45	38
45	49		60	34
75	49		90	34
30	80	250	45	50
45	65		60	45
75	65		90	45
30	88	300	—	—
45	73		—	—
75	73		—	—
30	100	400	—	—
45	84		—	—
75	84		—	—
30	110	500	—	—
45	94		—	—
75	94		—	—

**4. MARKING**

**4.1 Name Plate** — The following information shall be legibly and indelibly marked on the name plate;

- The name of the manufacturer and/or trade-mark;
- Manufacturer's type and serial number;

- c) The number of this Indian Standard ( Ref ISS 4804 ( Part III ) );
- d) Maximum conventional power in kilovolt-amperes at 50 percent duty cycle;
- e) Maximum short-circuit power,  $P_m$  in kVA;
- f) Maximum short-circuit secondary current in amperes;
- g) Supply voltage, frequency and phases;
- h) Maximum and minimum secondary open-circuit voltage;
- j) Class of insulation;
- k) Litres per minute, cooling water ( where applicable );
- m) Maximum electrode force, in kgf ( where applicable );
- n) Maximum throat depth;
- p) Maximum throat clearance;
- q) Air or hydraulic pressure range in kgf/cm<sup>2</sup> ( where applicable );
- r) Water pressure range in kgf/cm<sup>2</sup> ( where applicable );
- s) Maximum temperature of input cooling water;
- t) Country of manufacture; and
- u) Weight of the equipment.

**4.1.1** The welding machine may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

# INTERNATIONAL SYSTEM OF UNITS ( SI UNITS )

## Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

## Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

## Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m/s <sup>2</sup>
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m <sup>2</sup>
Frequency	hertz	Hz	1 Hz = 1/c/s (s <sup>-1</sup> )
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	Pascal	Pa	1 Pa = 1 N/m <sup>2</sup>

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